

History of the Reaction Breakwater at Aransas Pass, Texas

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BULWARKS OF A REPUBLIC



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Conservatism is not always the handmaiden of Progress as may be seen from the opposition which has attended the efforts to introduce an economic agency into the service for the utilization of natural forces for the improvement of commercial channels.

Early in 1887, the writer, under a *nom de plume*, submitted to the American Philosophical Society a thesis, entitled "*Physical Phenomena of Harbor Entrances*," to secure a disinterested analysis of its merits, by experts, and nine months later, or on the 16th, of December, the Society awarded to its author the highly prized "Magellanic Premium for his Discovery in Physical Hydrography and his Invention of a System of Harbor Improvements." Immediately thereafter the plans were presented to the United

*Read by title.

States Board of Engineers, which filed a report in the War Department, dated March 16th, 1888, concluding in these words:

"The views are purely theoretical, are unconfirmed by experience and contain nothing not already well known, and which has a useful application in the improvement of our harbors."

No copy of this report, so adverse to the findings of the Philosophical Society, was sent to it or to the author, but was accidentally discovered some months later when a communication was mailed to the Chief of Engineers requesting permission to establish the truth of the so-called "theory," and asking for the citation of a precedent, in these words:

Gen'l Jas. C. Duane, Chief of Engineers.

June 30, 1888.

Dear General:—

I have the honor to forward herein a copy of my Reply to the Report of the Board of Engineers. . . . Since I believe the plans to be new, and hence unprecedented, it would doubtless be satisfactory to the Board, as well as to myself, if an opportunity were given me, to make a test, or to be referred to a similar construction which has failed. If there be none, it would be a valuable contribution to the profession to have a record of the facts from experience. I have therefore the honor to request that you will recommend, with the approval of the Board, if you so desire, that a trial be made, at a site to be agreed upon by the parties interested, in securing deep water."

On September 14, a letter was mailed to his successor, General Casey, making a similar request, and copies of the "Reply" were sent to all the members of the Board, but none of these communications elicited an acknowledgment.

This heritage of prejudged condemnation and opposition to demonstration has characterized all of the six succeeding administrations, to the present time, and although Congress subsequently intervened, at a late date, to require a test to be made, it is now proposed to destroy the automatic results which have been secured, prior to the establishment of the equilibrium of the active agencies, as will appear from the sequel as set forth in this brief narrative of events.

In the Historical Résumé herewith, (Appendix "A") it is shown that from 1853 to 1879. (26 years) the Government hesitated to undertake work at Aransas Pass because of the reported existence of quicksands, constituting an "insuperable objection to

any such experiment," yet on the latter date it was estimated that a channel of *twelve* feet deep might be secured for \$759,185 by the use of two jetties, and the southerly one was commenced in 1880.* Up to May, 1889 (10 years), there had been expended on this work \$550,416 with "insignificant results" when it was suspended. Before suspension, however, it was modified to provide for a twenty-foot project, estimated to cost \$2,052,543.72. It has been shown also that the work done under the Aransas Pass Harbor Co., holding a franchise from the Government, which it succeeded, rapidly scoured out the bar until the old jetty previously built and reported as having disappeared, was discovered to be in

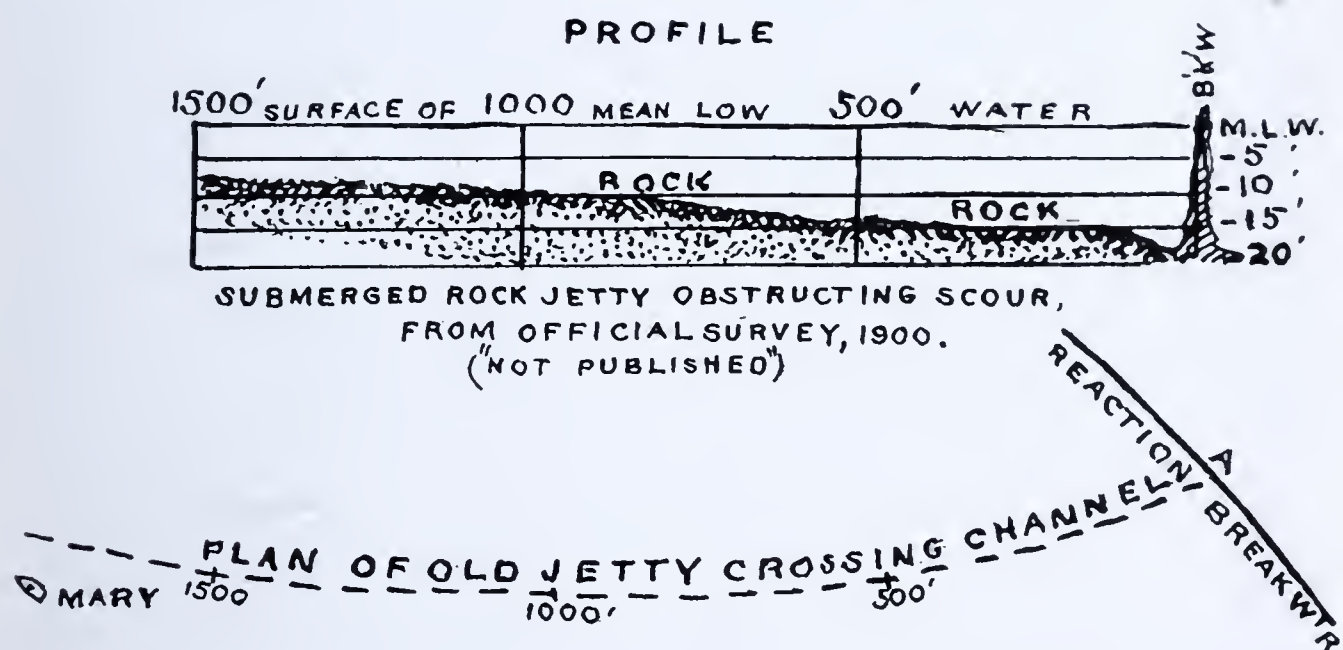


Fig. 1. Plan and profile of old government jetty between wreck "Mary" and the reaction breakwater, showing depth to rock, which prevented scour by acting as a submerged dam.

place at a depth of eight to fifteen feet, and lying directly across the channel, where it intercepted the currents and prevented further deepening, and that Congress passed the act of 1899, requiring the obstructing jetty to be removed, the work to be done in such a manner as to in no wise interfere with the curved jetty now located in said harbor. (See Fig. 1.)

It was unfortunate that this act was so worded as merely to "authorize the Secretary of War to contract for the removal," &c., so that the work was authorized and advertised September 25, 1899, at which time it was hoped that this obstruction would finally be removed and the currents be free

*Genl. Craighill, a member of the Board, objected, as he did "not coincide with the views of the officer in charge in general application or in particular at this locality," and believed that one jetty would suffice.

to complete the scouring of the channel. This same act also provided that the private corporation should surrender its franchise and the breakwater already in place at a cost to it of over \$250,000, merely on consideration of the continuance of the work, and such transfer was made March 27, 1899. The Government then let the contract for the removal of the old jetty, but did not require the contractor to execute it, as it was claimed that a survey made showed it to be no longer an obstruction.

This survey covered the months of October, November and December, 1900, when 529 borings were made along the site of the old Government jetty which crossed the channel. Most of these borings only went to the rock, covering the mattress foundation, but a few were sunk to a depth of twenty feet. The map was not published, but it showed the existence of rock in place entirely across the channel at depths of from eight to fifteen feet, yet the opinion was officially published that this old sill "was no longer acting as an obstruction," and it was allowed to remain. Another act of Congress was required ordering its removal, and as the sequel shows, the last of it was not taken out until *six* years later. It constituted a serious obstacle to scour. (Fig. 1 ante.)

After thirteen months delay the Government released the contractor and requested permission of the Judge Advocate General's Office to apply the appropriation to work on the curved jetty (prohibited by the act), which it authorized on the ground that having made a contract for the removal of the old jetty, the law was satisfied. The opinion of the Judge Advocate General upon the case as submitted to him by the War Department reads in part as follows: "Whether in view of the language of the act the removal of the old jetty can be postponed, and the money appropriated be applied to the work of jetty repair and construction?" . . . to which query the reply is made, "In my opinion the act is not to be construed as requiring the removal of the portion of the old Government jetty specified therein, but as authorizing the Secretary of War to contract for its removal . . . I am of the opinion that the entire appropriation can be expended for other improvements. (See Appendix "B" for more complete extracts.) The work was then, after several years of delay, let for the building up of the *inner* end of the breakwater, in violation of the design and to its injury, by causing erosion inside of

the bar and rolling it forward, which effect was to have been avoided by constructing from the outer end shoreward. This advance of the bar, with the old jetty, still in place, caused a deposit extending seaward for about a quarter of a mile with depths of thirteen to fifteen feet, there being over twenty feet at nearly all other points. (See Fig. 2, Profile of 1902.)

This condition of affairs made it necessary again to appeal to Congress, and accordingly, in 1902, a proposition was submitted by the Reaction Jetty Company with a memorial (see Appendix "C") offering to complete the work on the reaction breakwater and guarantee the channel for the sum of \$500,000, accompanied by large bonds and forfeitures, in case the contract was awarded to that company, and to finish the same within two years. The River and Harbor Committee was unanimously in favor of its acceptance, but the item was submitted to the Engineering Department for its opinion, which was not only adverse but it was accompanied by a communication without date or signature, containing serious errors of facts, and an offer was also made by letter to place a dredge there and create the channel by that means for \$100,000. It was furthermore stated that if the proposition of the company were accepted by the Committee the entire bill would be defeated, and under this view of the situation the Committee did not feel warranted in authorizing it to be done, but referred the responsibility to the Senate Committee on Commerce. Here it was opposed by the Member of Congress from the district, who refused to read the proposition, as well as by the former Harbor Company, because it had received no consideration from the Government for its previous work. While the Committee was favorably inclined toward the acceptance of the proposition to award the contract directly, it was informed by the Engineer Department that it would establish a dangerous precedent, but an agreement was made that "if Congress wished the plan tested it would be carried out by the U. S. Engineers in good faith." Accordingly the plan and rights were turned over to the Department with an appropriation of only one-half of the amount necessary to complete it. In view of the sequel the language of the act passed June 13, 1902, is important. It reads as follows:

"Improving Aransas Pass, Texas. Continuing improvement

\$250,000; Provided, That the work at this harbor shall be confined to the completion of the north jetty in accordance with the design and specifications of the Aransas Pass Harbor Company, and in continuation of the work heretofore carried out on said jetty by said company, and to such additional work as may be necessary for the strengthening of such jetty, and for the removal of such part of the old Government jetty and any other hard material which may interfere with the formation of a channel by the natural action of the currents."

The clause herein providing for the "strengthening of such jetty" would have enabled the Government to enlarge the dimensions and height of the breakwater, thus adding greater pressure on the base, offering more resistance to wave action, without controlling more current, but increasing the cost and liability to deterioration, as well as the time to complete, as was shown in the specifications subsequently issued, which added twelve per cent. to the sectional area of the structure—without corresponding benefit.

Soon after its passage an offer was made to assist in the preparation of the specifications so as to have them conform to those of the Company, but it was declined. When they were issued it appeared that with the exception of the citation of the act, there was no reference to the plans and specifications of the Aransas Pass Harbor Company's method or plans contained therein, so that it became necessary to call official attention to this departure from the express terms of the act, and the Secretary of War required them to be recalled and modified accordingly, which was done merely to bring them into substantial accord with the plans of the Aransas Pass Harbor Company to avoid further delay. The next move was a proposition to reject all bids on the allegation that they were excessive, but before doing so a former U. S. civil engineer, having faith in the plans and desiring to have the demonstration completed, a man who had been in charge of the Galveston works for nearly twenty years, offered to undertake this work at a lower figure, and his bid was accepted, after he had first filed his bonds to take the contract. It was divided, so that \$50,000 of the money was made available for the removal of the old jetty, given to another party, and the balance, \$200,000, for the continuation of work on the breakwater, thereafter called

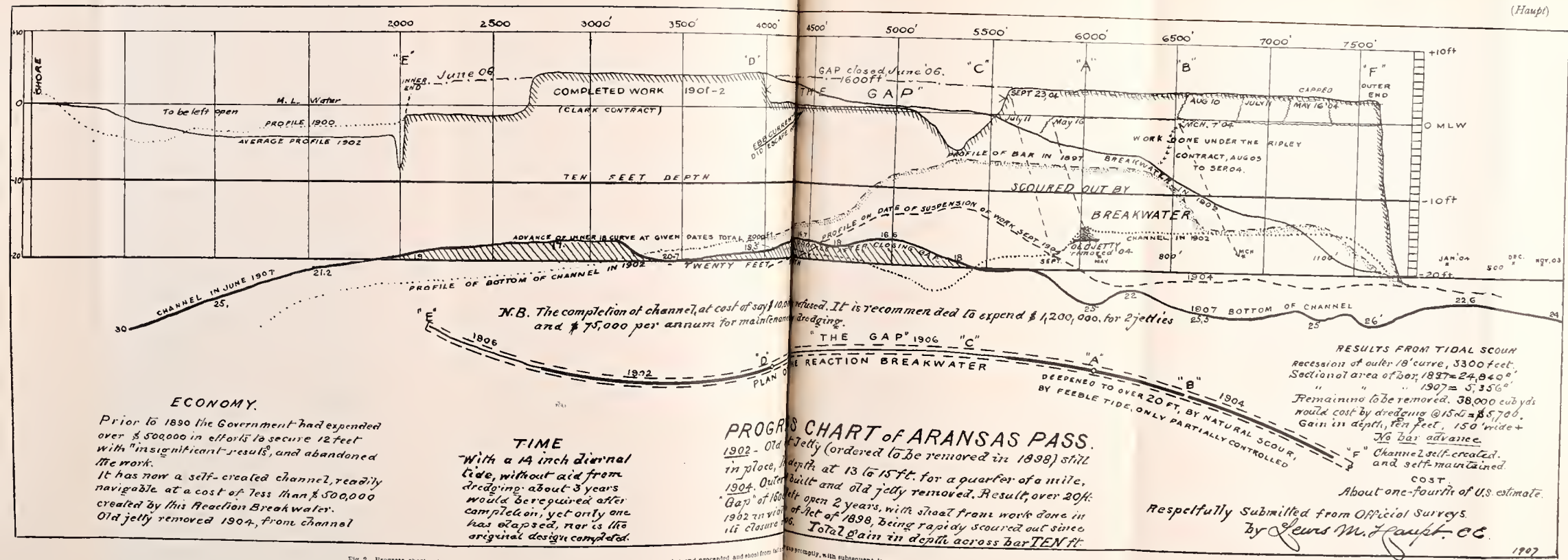


Fig. 2. Progress chart and profile showing the recession of bar by rapid scour as work at outer end proceeded and abated from the bar promptly, with subsequent improvements and bar almost entirely scoured out by natural action of currents.

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the "north jetty," by the Government, beginning at the outer end, in the open sea, and extending shoreward.

The contract was finally awarded him and the work was commenced in August, 1903, after a series of mishaps to his plant and the wrecking of his tug, the refusal of the Government to permit the capping to be placed for nine months, the rejection of blocks, &c. But space does not permit the recital of the detailed obstacles which beset his path, from beginning to end, including the quarantine from yellow fever. It is the result which is the subject of this recital, and the difficulties which attended the demonstration from beginning to close. His work was faithfully performed and the appropriation of \$200,000 was exhausted by September of 1904, by which time the outer half mile was completed. The old jetty was also *reported* as finally removed under the separate contract, by blasting but without dredging, so that the currents were partially freed after nine years, to work upon the bottom of the channel, yet they were not fully under control, for there was a gap left in the middle of the breakwater between the portion previously built at the inner end in violation of this plan, and the work just finished, of 1600 feet, through which the ebb currents escaped and the sand entered, thus forming a shoal with about sixteen feet depth upon it at low water. (See Fig. 2.)

RESULTS OF OUTER CURVED PORTION OF BREAKWATER.

As fast as the work was raised to the surface the scour became marked, the contours receded rapidly, cutting out a channel of over twenty feet and throwing the material over to the westward, building up a counterscarp automatically, and leaving an ample width under the lee of a perfect and continuous aid to navigation. These progressive changes are shown in the accompanying profiles of the thalweg of the channel and the breakwater with dates attached, indicating the relation of the work as it progressed to the depths secured. At this juncture a general emergency bill was framed with the expectation that it was to provide for the closure of "the gap," and the contractor had consented to continue work while his plant was on the site, upon the same terms, but the Department finally concluded that this work did not fall within the purview of the act passed April 28th, 1904, for the

“restoration or maintenance of channels.” The first objection made was based on the assertion that this was not a Government work, although it had been conveyed to the United States and Congress had made an appropriation for its continuance, but when this position was shown to be untenable it was thus claimed by the Government Engineer that “no such deterioration had occurred as to justify an apportionment.” The sequence of this refusal to close the gap was that the work was suspended and left in an unfinished condition for a year longer, or until another bill could be passed. The policy of the Department is clearly stated in a letter from the local officer in charge to the Chief of Engineers, written May 31st, 1901, or more than two years after the work done under the patent had been conveyed to the Government. The letter states; “So far as I am informed, there never has been any proposal on the part of the United States to make use of Professor Haupt’s patent at Aransas Pass. Existing projects for that locality are based upon the plan of a Board of Engineers, which contemplates the use of two jetties, is radically different from the plan of Professor Haupt, and cannot therefore infringe on his patent. . . . The United States has not used his patent there, nor does the existing project contemplate its use.” Yet this Board of Engineers, in its report, so modified its two-jetty plan (see Fig. 3) as to provide for the removal of a “small part of the curved breakwater and utilization of the balance, as it would cost less than the approved Government plan,” but notwithstanding this embodiment of \$250,000 of jetty work and the removal of several hundred thousand yards of sand from the channel by natural scour it reported that the value of this work to the Government “is nothing,” and took it over without consideration as an essential part of the proposed “north jetty.” (Vide, Doc. H. R., No. 137, 55th Cong. 2d.) Still further, it was recently testified by the officer in charge at Galveston, that on July 14, 1902, the Acting Chief of Engineers . . . wrote to his predecessor as follows:

“The item for Aransas Pass does not mean that Congress has adopted the Haupt plan further than that a fair trial of the plan of the Aransas Pass Harbor Company is desired. Mr. Haupt made a strong appeal to the Committee of the House for a contract to complete his work for the sum of \$500,000 . . . Many

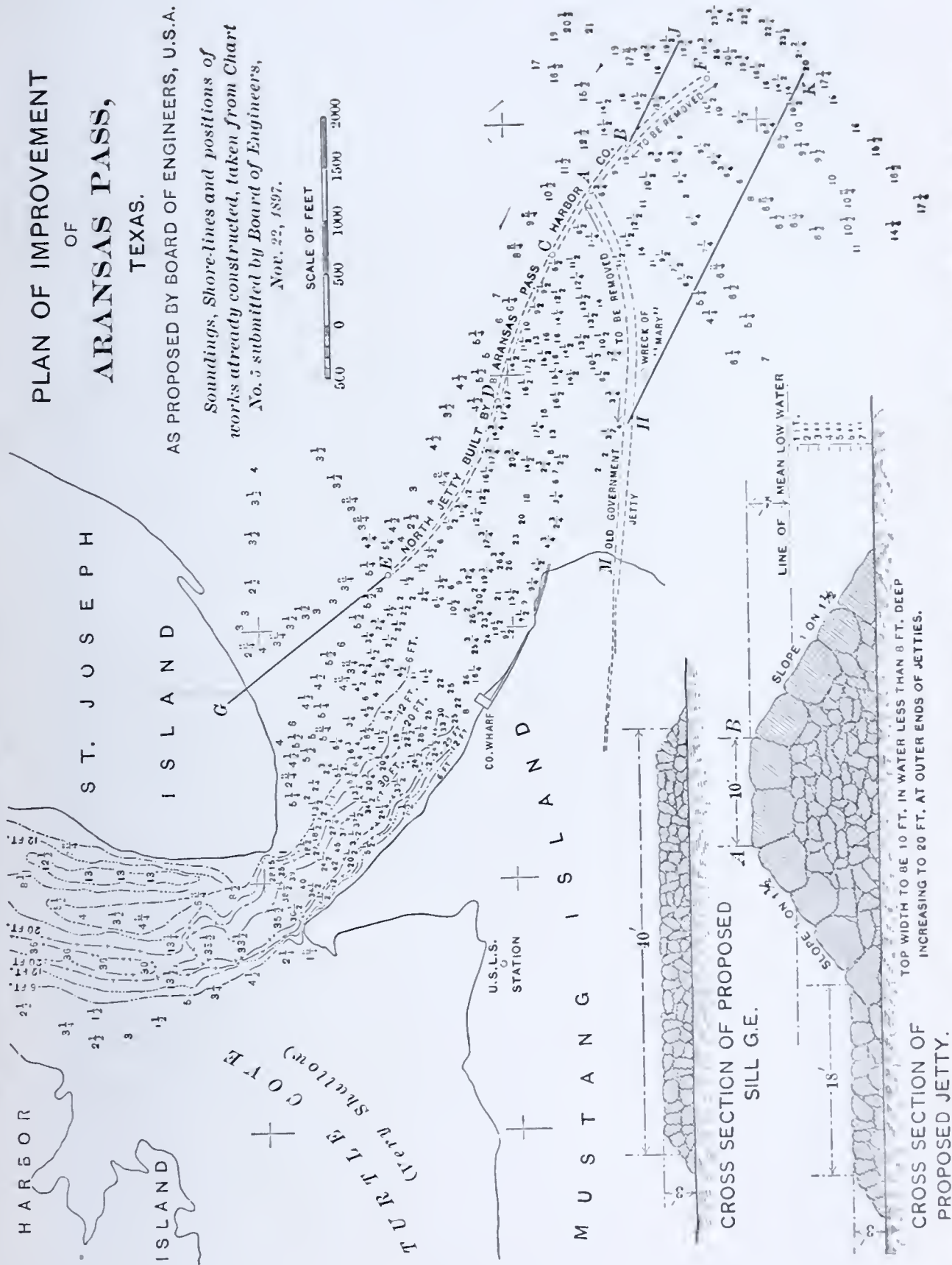


Fig. 3. Embodiment of the reaction breakwater in the two-jetty plan, as proposed by the government, at an additional mated cost of \$1,525,000, and later with \$75,000 annually for maintenance.

of the Members appeared to desire a test, and the wording found in the act was prepared by an officer of this office with a view and a promise that a full and fair test of the Haupt scheme for Aransas Pass should be provided for." . . . "The item regarding the removal of the old dam was also introduced with an object; it was claimed that such remnant of dam interfered with the full result, and its removal was promised." The officer of the district also testified that he gave interviews to the press reporting that the work was a failure, even when it was far from complete and before this obstructing "dam" had been removed, and that the two-jetty plan was essential to success.

In this connection it may be well to state that to establish its priority and form the basis for the organization of a Company to make tenders to carry out the work of economically improving our harbors upon the "no cure no pay" plan, as was done by Capt. Eads and others, a patent was applied for and granted in 1888, and under it a million dollar company was organized and tenders made without charge for any royalties for use of patents for the opening of the channels at the mouths of the Columbia, Mississippi, Hudson and other rivers (see Figs. 4, 5), which proposals were accompanied by guaranteed depths of thirty-five feet by natural scour, and which had they been accepted, would have saved to the Nation not less than \$20,000,000 in the cost of construction and a larger sum for maintenance. These proposals were referred to the Boards of Engineers, which rejected them, suppressed the tenders from the reports made to Congress, and also declined to permit the Company or its officers to inspect their findings, although the Secretary of War had agreed to a rebuttal. In consequence the Reaction Jetty Company was dissolved. On the third of March, 1905, an appropriation of \$100,000 was made to continue the work upon these plans, the language being: "Provided further, that the amounts herein appropriated and authorized shall be applied to the completion of the project in accordance with the design and specifications of the Aransas Pass Harbor Company, and in continuation of the work heretofore done, and to such additional work as may be necessary for strengthening the jetty." Under this act the work was resumed August 9th, 1905, and "completed" June 11th, 1906. The report for that year published a map showing a minimum depth of over sixteen feet, at

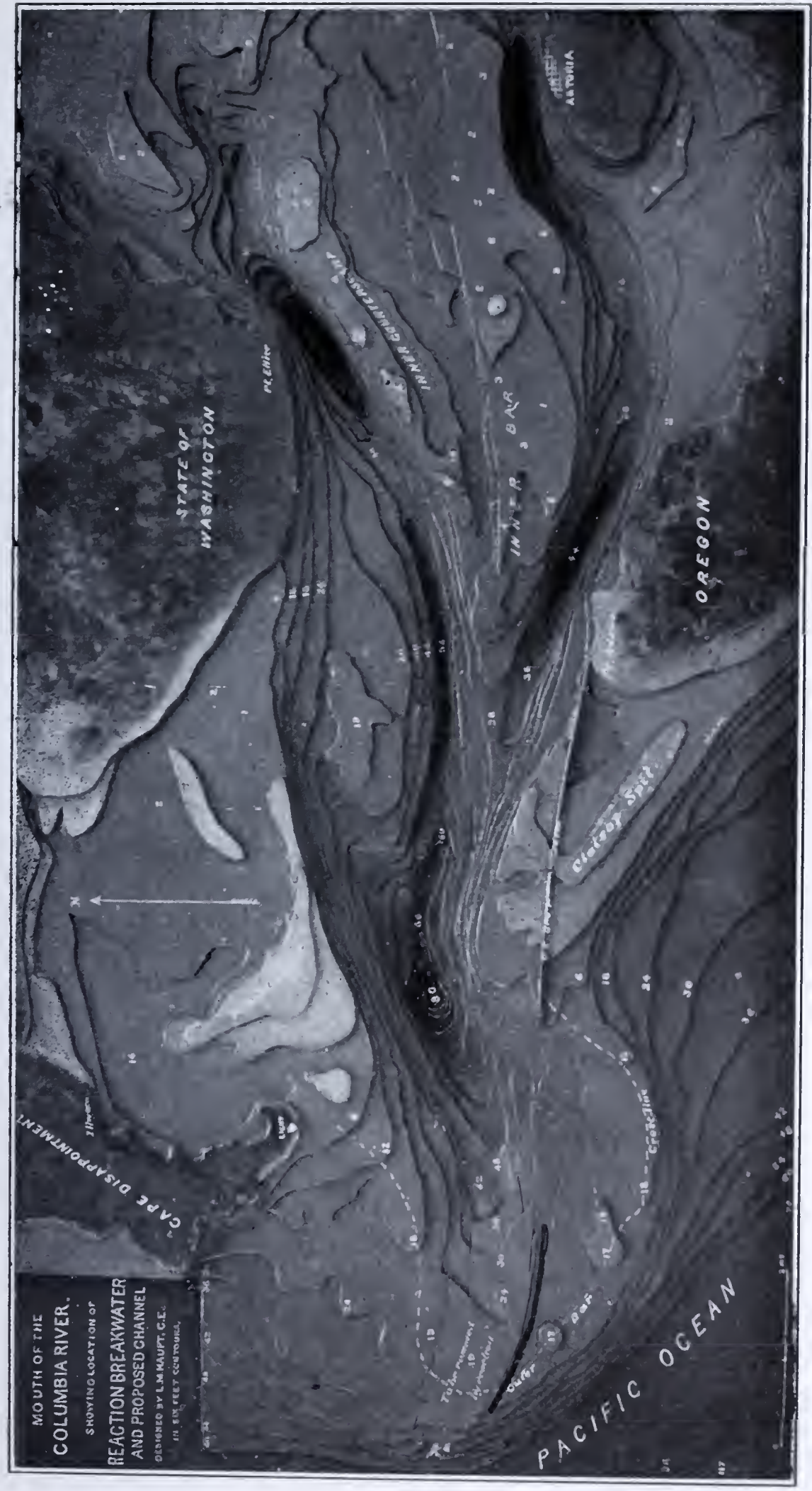


Fig. 4. Location of reaction breakwater for mouth of Columbia river, Oregon. (See black concave curve.) Channel over 35 feet for \$2,500,000. (guaranteed). The deep channels are the natural reaction depths cut by currents.

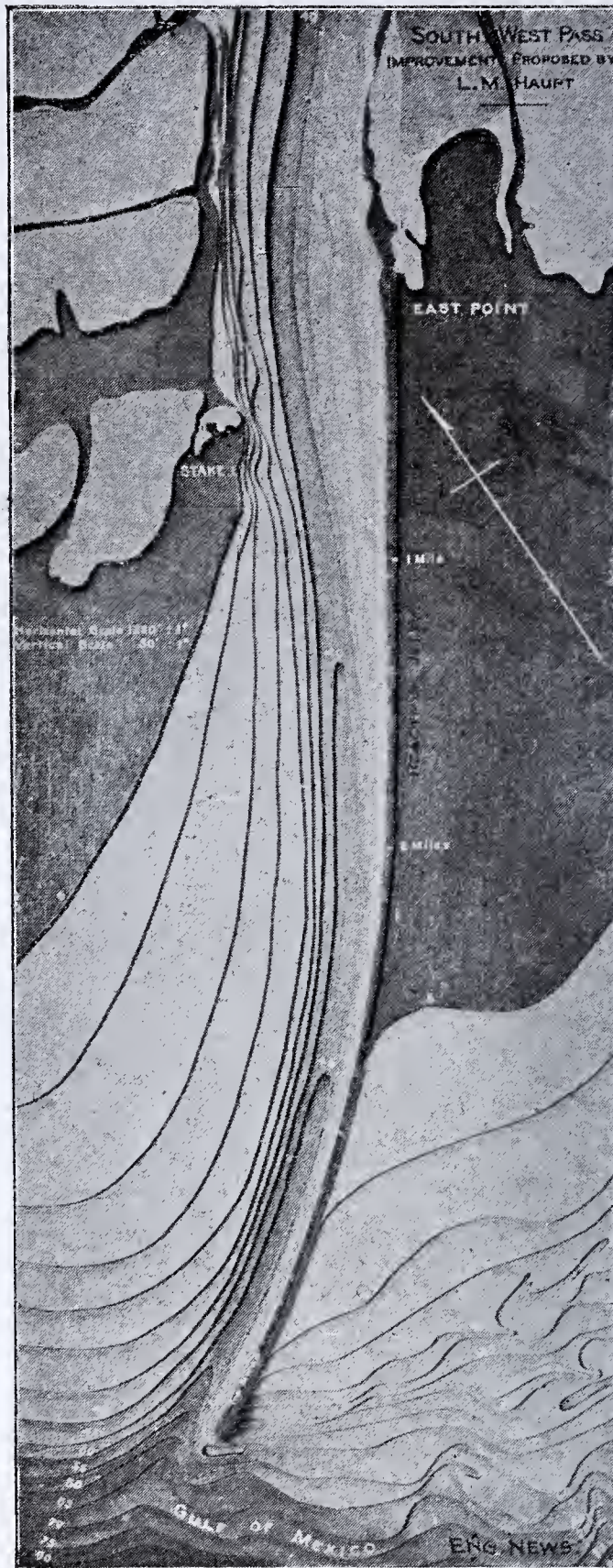


Fig. 5. Reaction jetty as applied to the mouth of the Mississippi at Southwest Pass, guaranteed to create an automatic 35-foot channel for \$6,000,000, with over 100,000,000 cubic yards of sediment moving gulfward annually.

only one point in the channel, abreast of the former gap, and considerably over twenty feet for the half mile at the outer end, completed in 1904. It gives no description of the channel nor its great improvement over the original six feet, other than to state that "a rock lump with 16.5 feet of water on it was brought to the attention of this office near the close of the year. It is believed to be a part of the old Government jetty overlooked by the inspectors." The present report (1907) from the new local officer states that this lump has been removed, but it is silent as to the depths or condition of the channel, and although a survey was made in June, 1907, showing still further deepening and improvement, it is not published. (See Figs. 6, 7.) On the contrary, within about six months of the closure of the gap a Board of Engineers was called upon to report upon the conditions at the Pass, and on the 6th day of December, 1906, after a visit to the site and public hearings, it stated that "The Board has not sufficient information upon which to base an opinion as to what is now the best method to be pursued to obtain a suitable entrance channel across the bar, nor what the cost of such a channel would be, nor as to the probable location of and the means of connecting the deep water of the Pass with the commercial port that may be expected to develop. Such data can be obtained only by an additional examination and survey, which is recommended."

Thus it recognized that there was a "*deep water*" channel at the Pass which it was desired to connect with the proposed new terminals in the bays, and that a survey is necessary before a plan and estimate can be submitted.

This report was apparently so unsatisfactory to the Department, however, that the Board was instructed to re-examine the subject, and on the 22d of the same month it reported on some data sent to it by the officer in charge of the district, in favor of a return to the original two-jetty plan of 1887, without stating reasons or alleging any failure of the reaction breakwater, which had not even yet been completed as designed, nor had there been sufficient time for the channel to have been fully formed by the natural scour of the currents. The Board approved the recommendation, and the rough estimates amounting to *more than a million dollars*, but made the significant suggestion that in its opinion sufficient time had not elapsed for the effects of the work to become manifest and placed the responsibility upon Congress,

accompanied by a preliminary appropriation in the bill of \$490,000 for the beginning of this work on the two-jetty plan, with an estimate of \$75,000 *annually for dredging*, which had been rigidly prohibited hitherto. Thus the work of destruction of the break-water was inaugurated. At that time no survey had been made since the previous June (1906), when the rock from the old jetty was found limiting the depth to 16.5 feet, while the channel was, and still is, steadily improving. In addition to this the bill carried nearly \$300,000 for interior channels from Aransas Pass to Corpus Christi and Cuero, due to the additional depth already available across the bar in consequence of the scour from this work, upon which only about \$500,000 in all appears to have been expended by the Government, instead of over two million, as originally estimated.

Moreover, before this bill became a law, the Chief of Engineers sent a communication to the Senate Committee, dated February 16, 1907, only eight months after the gap was closed, stating, *inter alia*, that "The work has not been successful in obtaining and maintaining such a channel as was promised."

In this statement he overlooked entirely the qualifications as to the *time* required to develop the channel by natural scour, for when asked by the Chairman of the River and Harbor Committee, in 1902, how long a time it would require, the writer made this reply: . . . "It is unsafe for any man to prophesy . . . but in the light of past experiences and under ordinary conditions, I should say that the deepening might be expected to take place at Aransas Pass at the unusually rapid rate of about eighteen inches per annum, so that to get six feet would require about four years. The process would be slower towards the end of the work in consequence of the longer channel and larger amount of material to be removed as the channel deepens. . . . At Dublin,* the most successful on record, the rate was less than three inches per year. . . . It would be a mistake in my

*Vernon-Harcourt says: "The results of these works (at Dublin) have been most satisfactory, as shown by the profiles of the channels in 1819, 1856, and 1878. Ten years after the completion of the north wall, the bar had been lowered five feet, and in 1861, the total increase in depth amounted to seven feet, and reached nearly to ten feet in 1873." (See *Rivers and Canals*, p. 239.)

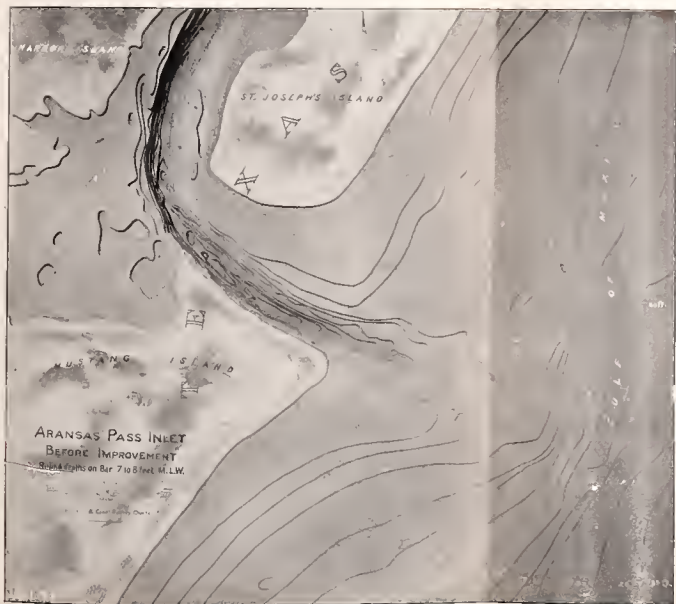


Fig. 6 Condition of bar off Aransas Pass after the suspension of work by the government on the proposed two jetty plan in 1889, the south jetty as built, having been covered with the drift and reported as having "disappeared".



Fig 7. Condition of channel at Aransas Pass after closure of the gap June 11, 1905, and before the completion of breakwater as designed—had not rapidly deepening and enlarging.

judgment, to tie up the commerce of the country, while awaiting the tardy process of natural erosion, when a little aid (from dredging) would secure immediate and permanent results." But the Committee wished to test the currents and no dredging of the channel was permitted.

At the date of the closure of the gap the depth lacked less than four feet of the predicted twenty, so that at the rate stated of eighteen inches per annum it would have required nearly three years after the work was "completed" before this test could be said to have been fully and fairly made, but as the amount of silt remaining, as shown by the survey, was less than 40,000 cubic yards, which could have been removed for about \$6,000 in a few weeks and thus have completed the channel, I requested that Congress make this small amount available out of the appropriation of the \$490,000 to hasten the formation of the channel, believing that the remainder would not have to be expended, but this was declined.

Further, the Chief Engineers informed Congress that "In my opinion the adoption of the Haupt plan for improving this harbor has resulted in adding greatly to the expense which will ultimately be necessary before a deep draft* can be obtained." As the original Government estimate, which guaranteed nothing, was in excess of \$2,052,000, and as the present estimate to complete, including \$100,000 for a dredge, is \$1,288,699—and the Government has already expended say \$500,000, it would make the total cost by the utilization of the work already done, excluding the dredge, about \$1,688,000, or more than \$300,000 less than the first estimate, but it will certainly cost far more to create and maintain the channel at \$75,000 per year, as estimated, than would be the case if nature were permitted to do the work herself, or if the \$6,000 were applied to open it by dredging immediately. He concludes, nevertheless: "Far from Mr. Haupt's plan having in any degree benefitted the Government, I think it has injured it greatly. . . . I know of no other localities at which Mr. Haupt has tried his plan, or accomplished any results. . . . I do not recommend the enactment of any legislation such as he suggests."

*The project was for a twenty-foot draft, and it is expected that the reaction jetty will give about twenty-five or more.—L. M. H.

It is needless to add that no dredging was permitted to remove the small amount of material to complete the channel, in far less time than had been predicted, and under exceptionally unfavorable conditions. During the past year, not only have there been no severe "Northerners," so important for scour, but the winds during the summer season have prevailed from the South, driving the beach sand into the face of the breakwater, cutting off about 1000 feet of Mustang Island and rolling it into the channel, yet the last reported depths were from eighteen to over twenty feet all the way across the bar. In fact it was credibly stated, early this month, that the twenty-foot depth had been cut through. This can hardly be anticipated until after another winter at least shall have passed and the inner flank of the Breakwater shall have been constructed as originally designed, to arrest cross-currents.

RESULTS.

As to the measure of success which has been attained by the system so far as it has been completed, it may be well to add that the official reports of the Life Saving Service, stated on August 16th, 1906, or two months after the closure of the gap, that "the breakwater gives a depth of fifteen feet with sufficient width for safe navigation of vessels of such draught." On July 12th, 1907, it is said, "The least depth found on that occasion (in May) was eighteen feet. The tide may have been eight to ten inches above mean low, but it is approximate." This would indicate a gain of over two feet in nine months, covering one of the mildest winters known in twenty-five years.

A Government official, in forwarding a copy of the last survey of June, 1907, volunteers the statement that "It (speaking of the channel) shows large—twenty feet over the bar with some shoaler spots in the upper portion of the channel where the work evidently should be temporarily assisted by the use of a dredge."

Notwithstanding the evidence of Nature and the testimony of disinterested witnesses, as well as the opinions of experts, and the lack of sufficient time to complete the test, it appears that the tragedy is about to be enacted of appropriating a large sum from the National Treasury to put a quietus upon this test, before it could have secured the channel under any possible natural conditions.

UTILITIES OF THE SYSTEM AS GUARANTEED.

Some of the benefits which might have accrued to the Government from its adoption since 1887 may be briefly summarized as follows :

The saving in construction at Aransas Pass, about.....	\$1,500,000
The saving at Galveston, as proposed prior to present plan...	6,000,000
Reduction made in estimate at Southwest Pass.....	7,000,000
Guaranteed plan at mouth of Columbia (see Fig. 4) saving....	4,500,000
Automatic training wall for Ambrose channel, saving.....	1,500,000
<hr/>	
Total saving in cost of construction alone.....	\$20,500,000

The cost of maintenance if capitalized at five per cent. would probably aggregate an equal sum.

The Government plans have been radically changed since the submission of this system to Congress, and it is becoming generally the policy to-day, where practicable to build up the *windward* jetty first, beginning at the outer end and building shoreward, thus securing immediate results, although the simultaneous construction of the leeward jetty has the effect of preventing the lateral distribution of material and compelling the bar to move seaward, while the straight form prevents the “continuous reaction” and reduces the scouring effects of the effluent curenents.

At the Southwest Pass between 1898 and 1906, the average shoaling for the outer eight miles at the bar, has been 1.55 feet, while the maximum shoaling in channel abreast of Stake Island has been about fourteen feet, and the latest survey indicates an advance of over a half mile of the bar and a still further shoaling on its crest, the ruling depth in the channel being about twenty-one feet with dredges fully employed and the two-jetty plan almost finished. At Galveston, a bar has formed entirely across the 7,000 feet interval separating the jetties and the channel is flexed so that the crossing is now south of the South jetty, with the curvature much sharper than at Aransas Pass. These few illustrations may serve to show the serious nature of the problem of removing ocean bars and the desirability of opening these contracts to any one who may be willing to undertake them under satisfactory safeguards for, as well as from, the Government.

APPENDIX "A."

BRIEF HISTORY OF EFFORTS TO SECURE A HARBOR ENTRANCE AT ARANSAS PASS, TEXAS.

EARLY SURVEYS.

On January 13, 1853, Capt. Geo. B. McClellan reported that the channel over the bar shifted in one week from the north to the south breakers, creating a new depth of nine feet and leaving four feet in the old bed, causing the wreck of three vessels in as many days.

In 1854, a reconnaissance was made by direction of Prof. A. D. Bache, Superintendent of the United States Coast Survey, showing nine feet on the bar, with the inlet extending South-east from the site of the proposed light house on Harbor Island. Since then the inlet has been traveling southwesterly at an average rate of about 260 feet per annum with corresponding deteriorations in channel depths. (One mile in twenty years.)

1869. The first attempt at improvement, made in 1869, was a private enterprise consisting, of wooden hurdles filled with brush and extending for a length of 600 feet from St. Joseph's Island "to cut off a secondary channel." This temporary jetty caused a shoaling of two feet in the secondary and a like deepening in the main channel so long as it remained in place. It was on the *north* side.

GOVERNMENT WORK.

In 1871, Capt. C. W. Howell, U. S. E., forwarded a report from the late Lt. Woodruff, stating:

1871. "The cost of building a jetty from Mustang or St. Joseph's Island towards the bar, which would be able to resist the action of the storms upon the quicksand foundation, must be an insurmountable objection to any such experiment." This opinion was endorsed by Major Howell in these words: "I coincide with Lieut. Woodruff in the opinion that all the plans suggested and discussed by him offer no certainty of producing good results, and that the expense which would be incurred by testing them will be out of all proportion to the benefits derivable from success."

1879. A Board of Engineers reported August 9, 1879, that to obtain twelve feet of water by the plan recommended by it, of two parallel jetties 3000 feet apart, the cost would be \$759,185. The depth shown at that date on the chart was seven feet on the crest of the bar. The Board considered that one jetty on the *south* side might suffice, but the improvement would not *necessarily* be permanent. For this single jetty to produce twelve feet, the estimate was \$432,980.

BEGUN MAY, 1880.

1880. In May, 1880, work was begun on the single jetty extending from Mustang Island. A storm in August of the same year destroyed a large part of the work.

1883. In 1883, the citizens of Rockport and Corpus Christi subscribed

1887. "In view of the injury sustained by the works and the lack of results, a new survey was made in March, 1887, under the direction of Major Ernst. U. S. E." He reported that "The single jetty had but an insignificant effect, giving only eight and a-half feet depth, and that the channel was across the jetty, which was in a dilapidated condition." He submitted a new project to secure twenty feet by parallel jetties, 2000 feet apart, estimated to cost \$1,688,500, and added "The original estimated cost of this work, as here revised, is \$2,052,543.72."

1889. The Board appointed, March 2, 1889, recommended the concentration of expenditures upon the work at Galveston, but stated that the Harbors of Sabine and Aransas Pass were worthy of great consideration. Work ended May, 1889.

The Aransas Pass Harbor Company was incorporated March 22, 1890, and the Government relinquished the work June 30, 1890, after expending \$550,416.58. The estimated value of the work in place was

For the "old jetty from shore to wreck of Mary".....	\$68,400.00
And for the revetment of Mustang Island.....	163,307.41

From which it would appear that there was none of the jetty remaining beyond the wreck of the "Mary." The Company was to secure twenty feet of water by 1899 under the State grants and the franchises granted by Congress.* These have been twice extended, to January 21 of the same year.

*In 1891, the U. S. Coast Survey plans showed only seven and one-fourth feet on the bar.

sufficient after several years of labor, during a period of great depression, the Company was reorganized upon a basis of a land bonus of \$400,000 and the reaction breakwater, as planned by Prof. Haupt, was introduced.

Instead, however, of entering into a contract for the entire work as designed, the Company was only willing to construct about half of the necessary breakwater and entered into a contract, on July 3, 1895, with Charles Clarke & Co., of Galveston, for the sum of \$145,000 to complete this portion of the breakwater.

Work was commenced in August, 1895 and prosecuted so rapidly that by November of the same year (*less than three months*) the remains of the curved portion of the old Government jetty, built across the channel prior to 1885, and reported to have disappeared in 1888, were discovered in place, *covered with rocks at depths of from 11 to 13 feet*. This obstruction prevented further scour, making it impracticable to secure the predicted fifteen feet, until its removal, which was strenuously urged by the consulting engineers, but not executed by the Company. Instead, it extended the inner end of the breakwater and raised it to the surface, hoping thus more effectually to control the ebb currents, which were powerless to scour out this rock-covered sill.

1896. In this emergency, Col. C. P. Goodyear, of Brunswick, Ga., made a proposition to remove the obstructing Government jetty, and complete the entire breakwater for a lump sum, conditioned on results, and on September 12th, 1896, the contract with him was executed. The contractor exploded some 13,000 pounds of dynamite on the jetty, making a breach several hundred feet in length, and thus detaching the outer portion, although not removing it from the channel, but in consequence of his inability to obtain the funds from the Government for the results believed to have been secured at Brunswick, Ga., in time, he was obliged to suspend operations at Aransas, at considerable loss, in the Spring of 1897.

The breach made by Col. Goodyear, however, enabled the currents to pass through the outer portion of the bar and to continue their work, though enfeebled by the submerged jetty so that notwithstanding the prevalence of the strong South-east winds, driving large quantities of sand northwardly during the summer months, there was thereafter reported a progressive improvement in the depths over the bar, with the breakwater incomplete and the currents not then under adequate control.

1898. An examination of the bar, made on August 2, 1898, by competent engineers and sailing masters, revealed more water than had ever been reported for this location, and showed a remarkably well defined, fixed channel readily navigable for sailing vessels. This, too, notwithstanding the fact that no work had been done for over a year and that the season was very adverse to the maintenance of a good channel. The partial breakwater had built its natural counterpart of sand, solely by the action of the currents, sweeping out and reacting on the concave face of the structure, which does not appear to have settled after these several years of exposure.

Concerning the results secured up to that date it was reported by a resident of the Pass as follows:

"Having been stationed at the Aransas Pass Inlet since 1886, and being familiar with the depths of water on the bar, it gives me pleasure to say that since work was stopped on the unfinished breakwater, in 1897, there has been a continuous deepening and improvement in the channel, which is at present deeper than I have ever known it to be. This at a time of year when the South-east winds usually cause shoaling, but the currents now partly under control are able to maintain the channel they have created."

On the completion of the first contract, the Resident Engineer in charge reported to the Harbor Company the following results:

"The results which have been attained by the construction of this breakwater are satisfactory and marked to a degree. Considering the fact that the deep water lines are drawing closer together, the distance from twenty feet depth of water in the Gulf to twenty feet depth inside the bar being 3,500 feet, against 6,200 feet at the start, whilst the fifteen and twelve feet lines have made more material advance and the depth of water, the bar having deepened permanently three feet in a short space of time, there should be no reason to doubt that as soon as the currents have been controlled by the completion of the entire breakwater the anticipated results will be forthcoming."

"When the breakwater shall have been built up to its full height and length as proposed by the Consulting Engineers, there can be no question that the channel will deepen rapidly and permanent deep water secured. The sands carried by the flood tide will then be intercepted and the ebb discharge will be concentrated and restricted in its escape through the channel.

"The portion of the breakwater already built has had the effect of intercepting the sands of the flood tide, as the water is now shoaling north and east of this breakwater and the conditions of equilibrium of the flood and ebb currents are perceptibly changed."

Further, on the 11th day of February, 1899, Captain Welker, in command of the U. S. Coast Survey Steamer "*Bache*," engaged in making a complete survey of the Pass, wired the office, that there was a clear channel depth of *fifteen* feet entirely through. This was followed by a letter reporting that the weather conditions were so bad as to prevent surveys on the bay more than about one day out of each week. In his official report he also states:

"In 1895, the Aransas Pass Harbor Company constructed a jetty in the shape of the letter "S," on the north side of the entrance, which is still in existence, and ever since its construction there has been a marked increase in the depth of water on the bar. The present channel crossed the Mansfield Jetty, portions of which are still in position. An attempt was made to remove this by explosion of dynamite, with the result that the rocks scattered over considerable area and without doubt they prevented the current from scouring the bottom to its full capacity.

"It is my opinion that, by the completion of the present jetty and the clearing away of the rock in the entrance a channel of at least twenty feet in depth would soon be secured."

On the other hand the Board of U. S. Engineers, in reporting on this work shortly after the suspension of the Goodyear contract, said:

"It was thought by the Company's engineers that the old Government jetty acted as a dam to prevent further deepening. This jetty was therefore blasted out over a length of about 500 feet. This blasting was followed by an advance of the inside contours."

"There does not seem any probability that the jetty, as now constructed, will of itself secure and maintain any considerable increase of depth in a navigable channel of proper width."

Notwithstanding this guarded prediction the Welker report shows a progressive deepening from the eight and a-half feet, said to be the least depth, to fifteen feet, in a little more than a year with no additional work done at the site—and the latest reports, after the plan is said to have been completed (in 1906), are that the depths reach to from eighteen to over twenty feet entirely across the bar, which it is now proposed to destroy by a return to the original project of 1887, as recommended by the Board of U. S. Engineers for the purpose of maintaining a channel which is already *self-created* and readily navigable.

APPENDIX "B."

COPY OF OPINION OF JUDGE ADVOCATE GENERAL

As based upon the communication of the Chief of Engineers as to the appropriation made for the express purpose of removing the old Government jetty obstructing the channel scour at Aransas Pass, Texas. It reads:

December 17, 1900.

"Respectfully returned to the Secretary of War,

The River and Harbor Act of Mar. 3, 1899, contains the following item:

"Improving Aransas Pass, Texas. For dredging and other improvements of Aransas Pass Harbor, sixty thousand dollars; Provided, that the Secretary of War is hereby authorized to contract for the removal of that portion of the old Government jetty in said harbor from the end nearest to the curved jetty constructed by the Aransas Pass Harbor Company to the wreck Mary, in such manner as to in no wise interfere with the curved jetty now located in said harbor; And provided further, that said contract shall not be let by the Secretary of War, nor said work done, until the said Aransas Pass Harbor Company shall have properly released and surrendered all rights and privileges heretofore granted to it in said harbor by Congress, also the jetty constructed in said harbor." (30th Stats. 1128.)

In 4th endorsement hereon the Chief of Engineers says:

"The requirement as to removal of old Government jetty was introduced in the item by Congress and in accordance with the requirement a contract was entered into in January last, with Charles Clark & Co., but in the opinion of the Engineer officer in local charge of the work it would be to the interest of the work to postpone removal of the Government jetty as contemplated by the act and contract made in accordance therewith

until other and more important work had been accomplished. The District Engineer officer, Captain Riche, recommends that, instead of removing the old jetty at this time, the available funds be applied to repairs to what is known as the "curved jetty," and to dredging, surveys and contingencies, etc. He proposes to annul the present contract for removing the old jetty, no work having been done under it and the contractor being willing, and to make, without advertising, a new contract amounting approximately to \$75,000 in its stead, on terms considered by him very reasonable and advantageous, covering the work of jetty repair and construction considered essential at this time."

The matter has been referred to this office for opinion.

"1. Whether in view of the language of the act the removal of the old jetty can be postponed, and the money appropriated be applied to the work of jetty repair and construction proposed by Captain Riche."

"2. Whether it would be legal to abandon the present contract, by mutual consent, and substitute therefor a new contract with the same parties, covering the new work, without inviting competition by public advertisement."

"In my opinion the act is not to be construed as requiring the removal of the portion of the old Government jetty specified therein, but as authorizing its removal. An appropriation of sixty thousand dollars is made generally "for dredging and other improvements of Aransas Pass Harbor," and this is followed by the provisions that "the Secretary of War is hereby authorized to contract" for the removal of the portion of the jetty referred to. There appears to be nothing in the act which limits the expenditure of the appropriation, or any portion of it, to the removal of this jetty; and I am of opinion that the entire appropriation can be expended for other improvements. No objection is seen therefore to a supplemental contract with Charles Clark & Co. providing for the termination of the existing contract for the removal of the jetty, provided such action is deemed for the best interests of the United States."

As to the second point it was ruled that it could not be legally done without public advertisement.

The case as presented makes the opinion of the District Engineer superior to the decision of Congress as to the necessity of removing the obstruction which the Government itself had previously placed across the channel and which it persistently declared was not acting as an obstacle, even after a survey involving over 500 borings showing rock in place at depths of from eight to thirteen feet, had been made but not published.

It is a fact that the River and Harbor Committee in executive session called the writer before it and asked him what the cost of the removal of that obstacle would be, stating that it was the desire of the Committee to make a test of this method, and if the prediction of fifteen feet resulted from this part of the work, after the removal of the obstacle, then Congress would complete the work upon this plan, but that the whole matter was contingent upon the taking up of this obstacle. It was stated to the Committee that it could be done for \$50,000, and the Committee made it

\$60,000 to cover any possible contingency, and voluntarily inserted the proviso that the curved jetty in said harbor should in no wise be interfered with, so that the work might be conducted strictly in accordance with the design of the inventor.

The authority to apply the money to the jetty, conferred by the official opinion upon the allegation that more important work of "repairs" was required, and the release of the contractor after a delay of more than a year of inactivity, and the execution of a contract with him to build up the *inner* end of the jetty first, in violation of the proper method of procedure and while the old jetty still remained to obstruct the passage of the currents seaward, resulted in great injury to the channel by rolling the bar forward and creating a shoal by subsequently leaving a breach of about 1600 feet in the center of the work, for several years, thus enabling the currents to escape and the drift to enter the channel, still further delaying results.

All this was the sequence of the failure to execute the provisions of the act of 1899 in accordance with the expressly stated purpose of Congress. The old Government jetty was not removed until 1904, and even then a rocky lump remained with less than seventeen feet depth, which was only taken out in 1906, thus finally, after many years of delay, enabling the currents to operate freely upon the channel. The results which have followed, notwithstanding these most serious delays and unusual obstructions, have no precedent in the annals of harbor improvements in the world, either as to economy or results, yet it is now proposed to obliterate them by the immediate return to the original two-jetty plan of the Government, before the unaided currents of this feeble tidal inlet have had sufficient time to establish a permanent regimen, as agreed upon when the plan was taken over by Congress.

L. M. HAUPT.

APPENDIX "C."

MEMORIAL AND BRIEF SUBMITTED TO COMMITTEE ON COMMERCE, U. S. SENATE, FEBRUARY, 1902.

Improving the Entrance to Aransas Pass, Texas, by Natural Methods.

COMPARATIVE SUMMARY OF RESULTS AND COST.

Prior efforts by Government and others. *No results.* Cost, \$657,885. The "Haupt" plan, partially built by the Aransas Pass Harbor Co., *increased depth nine feet.* Cost, \$235,000. Cost, per foot of depth gained, \$26,111, which is unprecedented.

COMPARATIVE PROPOSITIONS.

The Government proposes to build *two jetties and dredge* a twenty-foot channel, which *will not be self-maintaining*; without guarantees or **time limi-**

tations; with no risks as to results and with no probability of continuous appropriations to complete for \$1,526,000.

Prof. Haupt, if given the contract, proposes to complete his curved breakwater, now embodied in the Government plan; guarantees the channel and its maintenance by tidal scour for two years, surrenders all rights under his patents at Aransas Pass, and gives bonds for the faithful performance of his contract, for the sum of \$500,000, *thus saving at least \$1,025,000* in case the plan succeeds; but should the channel not be secured, he forfeits the final payment of \$100,000, or should it not prove to be self-maintaining for two years, \$75,000 more, thus reducing the cost of the breakwater in place to \$325,000, all of which work is embodied in the Government plan, so that *it would lose nothing*. The bond of \$50,000 is given to protect the Government from any damages for failure to fulfil conditions of contract.

EQUITIES.

The inventor of this plan has a deep professional interest in the proper conduct of the work; his bill safeguards the Government fully and he proposes to prosecute the plan vigorously to completion. On the other hand, if these plans are relegated to unfriendly parties to be executed, it will cost more, take longer to finish, will not release the Government from claims for infringement of patent rights, and may be entirely defeated by an improper order of construction or failure to remove the obstructing jetty.

The work has already been under the Government control for about three years, with an appropriation specifically made for the removal of the old jetty, which has not been done.

THE VALUE OF THE WORK.

The Report of the Board of Engineers, dated November 22d, 1897, states:

"The value to the Government of the works of the Aransas Pass Harbor Company for the improvement of Aransas Pass, Texas, is nothing."

Up to the date of the abandonment of this Pass by the Government, in May, 1889, it had expended \$550,416.58 without material improvement, while the Harbor Company subsequently expended \$235,000 on the north jetty, which at the date of the report had deepened the channel from 6½ to 9¼ feet,* and it has since continued to deepen without assistance or further work, to 15½ feet, at which depth the channel is held by the remains of the old, rock-covered jetty, built by the Government and reported as having "disappeared."

The Government's revised estimate for securing twenty feet by two jetties and dredging in 1889 (vide reports of Chief of Engineers) was \$2,054,343.72, and in 1898 (Doc. 119, H. R., 55th Cong., 3rd Ses.) it was

*Document 137, H. R., 55th Cong., 2nd Session.

\$1,525,000.00, showing a reduction of \$529,543.82 due to the results secured by the works of the Harbor Company, which were reported to be of no value.

Prof. Haupt, the inventor of the curved breakwater which has produced these unprecedented results, has proposed to Congress to complete his work and to guarantee the channel for \$500,000, thus saving the further sum of \$1,025,000, and he further agrees to maintain the channel for two years by tidal scour without charge, or forfeit \$75,000 as a demonstration of the great value of the device, even under such adverse circumstances. He further surrenders all claims for royalties at Aransas Pass in case he is permitted to complete his breakwater at that place.

PHYSICAL RESULTS OF THE WORK.

This report also states that in the opinion of the Board,—

“There does not seem any probability that the jetty as now constructed will of itself secure and maintain any considerable increase of depth in a navigable channel of proper width.”

(Vide Page 15, Document 137, H. R. 55th Cong., 2nd session.)

On the contrary, the results have shown how little the operations of the curved jetty were understood by the Board, since this incomplete structure, without any additions or aid from dredging, has caused the removal by scour of over half a million cubic yards of material, has increased the depth of the channel nine feet, at the shoalest point, has maintained and fixed the channel in position and has deteriorated less than most jetties, notwithstanding its incomplete condition, both as to length and capping. It has not been undermined nor is there even a trough near its base, while the maximum depth shown* was 25¼ feet.

All this without cost to the Government, since this is the result of the work done by private parties and turned over to the Government three years ago on condition of its being completed at once.

This progressive deepening, widening and maintenance is now arrested by the presence of the old Government jetty. Such a result is believed to be unparalleled in the annals of harbor improvements, and it has been crowned by the highest premiums from learned societies.

THE OBSTRUCTING “OLD GOVERNMENT JETTY.”

This jetty was built between February, 1881, and April, 1885. In the Report of the Chief of Engineers for 1882, page 1314, it is said: “The work designed to deepen the channel over the bar was a jetty on the south side of the entrance. It was constructed upon a line running east and west to a point 2,352 feet from the shore, where it curved northward upon a radius of 2,880 feet and extended 1,698 feet further, making a length from shore of 4,050 feet.

* * * * *

*Vide official survey of 1900.

It was constructed of superposed mattresses ballasted with stones. . . . It appears that the curved portion of the jetty has practically disappeared. Of the straight portion . . . that which was built out into the Gulf has its crest, upon an average, about three feet below mean low tide. . . . Its height above the bottom has diminished about 6.2 feet, or over 50 per cent. . . . The effect of the work upon the bar has been insignificant."

The expenditure for this experience was \$393,556.95 to July, 1887.

As the work of the Harbor Company proceeded, the current scour soon revealed the existence of this obstructing jetty lying across the entire channel so that it limited the depth, and as it was not anticipated, due to the report quoted above, no contract had been made for its removal.

When the work was returned to the Government, in 1899, it immediately appropriated \$60,000 for the removal of the old jetty "in such manner as to in no wise interfere with the curved jetty now located in said harbor."

A contract was let in accordance with the terms of this act, but no work was done and after thirteen months had elapsed it was annulled.

A careful survey with borings was made of the old jetty, and upon it the opinion was expressed that "It was not acting as an obstruction." (See Report, Chief of Engineers for 1901, page 1952.) The drawing was "not printed" but it shows very clearly that this old jetty is still in place, covered with rock extending entirely across the channel at depths of from 11 to 15½ feet. It is therefore an absolute barrier to the creation of the proposed twenty-foot channel or to the further deepening of the present improved one, and yet, in consequence of these representations, authority was obtained to permit it to remain and to apply the money appropriated for its removal to the part of the jetty which was not to be interfered with under the law, with the result that the work now under contract is causing shoaling and bar advance, so long as the jetty remains and the outer end of the breakwater is incomplete.

Thus all efforts to secure the removal of this serious obstacle to the creation of the channel by scour have been thwarted, and it remains a barrier to commerce as well as a bar to the demonstration of the complete practicability of the reaction breakwater.

OTHER BARRIERS.

In a recent communication* to the Chairman of the Rivers and Harbors Committee, from the office of the Chief of Engineers, occurred these statements:—

"The Government jetty contemplates an apron of stone along entire length of jetty, eighteen feet wide, three feet thick, which is not a part of the Haupt plan, and requires about 17,000 tons of stone."

A reference to the original plans of the Haupt jetty, as published in the official report, Doc. 137, would have avoided this error, as the apron of the full dimensions is there shown as it was built and from which that in the

*Without date or signature.

Government plan is copied. (See same document.) It is also stated that, "The Government plan contemplates a sill from the end of jetty to shore, etc."

If this sill is built, it will defeat the purpose of the breakwater by cutting off a large portion of the only force available for scour, and ultimately require a second jetty and dredge to secure and maintain the channel, so that it would be a fatal mistake, as there is no injury to the physical conditions by leaving it open for the free admission of the tides. This is fundamental to success.

ARGUMENT AGAINST HAUPT'S PLAN BY THE ENGINEERS.

Again it is stated: "The Haupt jetty on Government plan will cost \$575,000, including sill and apron."

Such sill and apron are estimated to cost \$94,250 by the engineers at an assumed unit price, which is less than the present contract price. The letter is a criticism of Haupt's bill for deepening channel at Aransas Pass, and this statement is a comparison of cost of work under his bill and work if left in the hands of engineers.

It seeks to show that there is no "apron" in Haupt's plan, which is erroneous; also, that a "sill" is needed. Although a sill is no part of Haupt's design, and would defeat its purpose, and that if the cost of sill and apron, \$94,250, is deducted from their estimate with sill and apron, they will do as much with \$480,750 as Haupt with \$500,000.

This is in no sense a fair comparison. For they say Haupt's Breakwater will not get the twenty-foot channel and offer a plan at a cost of \$1,525,000, which they say will get the water by aid of dredging. Haupt says his device will get such channel, and maintain it without artificial aid for two years at a total cost of \$500,000, and agrees to forfeit \$75,000 if it is not thus maintained. He also forfeits last \$100,000 to be paid for breakwater if full twenty feet, 150 feet wide is not procured. He is paid, therefore, for *merely* building of breakwater, but \$325,000, which would be their basis of comparison with their estimate of \$480,750, without sill or apron, assuming, as they do, that neither Haupt's nor their construction of breakwater, unaided, will get the water.

The comparison, however, should be between their estimate of \$1,554,423.72, which they say *should* get the water by dredging and jetties, and Haupt's \$500,000, which he believes, as shown by local physical condition, *will* get the water, and any other basis can have but one effect, namely, to cloud the real issues.

To be entirely fair, comparison should be stated thus:—

Expended by U. S. Engineers, without result, up to 1890 (on twelve-foot project).....	\$ 550,416.58
Their revised estimate for twenty feet.....	2,052,543.72
	<hr/>
	\$2,602,960.30

Spent by A. P. H. Co on north jetty (gain, depth nine feet).....	\$235,000.00	
Bid by Prof. Haupt to complete.....	500,000.00	
	<hr/>	735,000.00
Difference saved had Haupt plan been available from the start..	\$1,867,960.30	

*Brief of L. M. Haupt and Associates to Improve Aransas Pass,
Texas, for \$500,000, which is less than One-third of the Esti-
mated Cost by the Government Plan.*

The proposal is to create a channel and to maintain it for two years by the natural scour from the tides, having a width of 150 feet bottom, and a depth of twenty feet over this width, entirely across the bar, by means of a single curved or Reaction Breakwater of stone, of sufficient dimensions to control the currents but not oppose too great superficial resistance to waves, for the sum of \$500,000.

The work is to begin within three months and the channel is to be secured within three years or he shall forfeit \$175,000 of the above amount, and he shall also file a bond of \$50,000 for the faithful performance of the contract.

The work shall be done under the Secretary of War and the payments be duly certified by an experienced Government official in his department, to be designated by him.

In consideration of this contract, the said Haupt shall surrender all his patent rights to this improvement at Aransas Pass and make no claim for its use or for damages. He shall further remove the obstructing old Government jetty and complete the breakwater as designed for the Aransas Pass Harbor Company in 1895.

He shall take all risks, and in case of failure to commence or to continue the work as specified, he shall forfeit it and his penalties without delay and the work shall be continued by the Government.

The Rivers and Harbors Committee being unanimously in favor of completing the Haupt plan, proposes the following item:

- “Improving Aransas Pass, Texas.
- “Continuing improvement, two hundred and fifty thousand dollars: *Provided*, That the work at this harbor shall be confined to the completion of the north jetty in accordance with the design and specifications of the Aransas Pass Harbor Company, and in continuation of the work heretofore carried out on said jetty by said company, and to such additional work as may be necessary for strengthening such part of the old Government jetty and any other hard material which may interfere with the formation of a channel by the natural action of the currents.”

OBJECTIONS TO PRESENT FORM OF ITEM.

Under this provision of the House Bill the work is transferred to those who have persistently opposed it as of no value and who have predicted its failure, to be executed, with an amount not half large enough to complete, and with the probability that it may be expended in injuriously enlarging the dimensions without producing additional scour, with no responsibility for results and no limitations as to the time within which the work shall be commenced or completed. Neither is there any guarantee that the obstruction after Congress had directed its removal and made an appropriation therefor, will be sufficiently removed nor that the work will be prosecuted in such order as to produce scour instead of deposit, nor that the admission of the flood-tide upon which the scour depends will not be seriously restricted by the proposed sill embodied in the Government plan and constituting part of its north jetty, any or all of which would prove injurious if not disastrous to the Haupt plan and ultimately involve the further expenditure of more than \$1,000,000 in a second jetty and for dredging and further sums for maintenance which are not provided for in this bill.

It is therefore proposed to request the Senate Committee on Commerce to accept Professor Haupt's proposition as being reasonable, safe, equitable and in the interest of the public service.

All of which fears have been fully confirmed by the subsequent expenditure, and the life of this patent has expired.